(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 246 032 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 87304087.7

(51) Int. Cl.⁴: B05B 3/10

(22) Date of filing: 07.05.87

(30) Priority: 10.05.86 GB 8611460

(43) Date of publication of application:
19.11.87 Bulletin 87/47

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

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(54) Spray devices and spraying systems.

(57) A spindle 12 and a disc 10 are rotated. Fluid to be sprayed is passed through a feeder tube 24 to impinge on the conical valve member 30. When the fluid flow rate is considerable, the valve member 30 deflects the flow outwardly and the fluid then hits the diffuser plate 34 and is deflected outwardly towards the surface 38 of the disc 54. When the fluid hits the disc it is caused to move outwardly as a result of the centrifugal force exerted by the spinning disc. The fluid then travels over the surface 38 until it leaves the periphery 40 of the disc and is thrown outwardly.

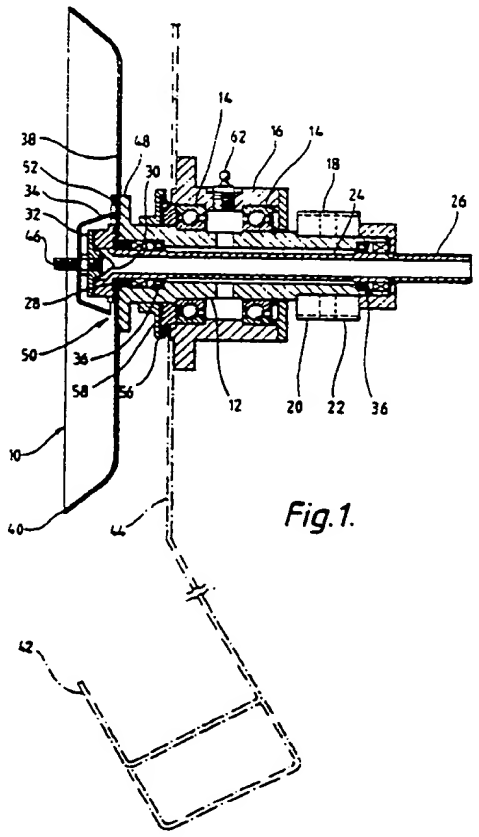

Fig.1.

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SPRAY DEVICES AND SPRAYING SYSTEMS.

The present invention relates to spray devices and spraying systems and is particularly, although not exclusively concerned with spraying various glazes, oil, slurry, sugar, syrup, water, emulsion and many other materials with or without particles in suspension in the bakery, confectionery, snack food, frozen food, meat and savoury pie production and other food processing industries.

At present, fluid to be sprayed is supplied to the centre of the concave surface of a disc from a fluid supply pipe extending around the side of the disc and having a discharge end spaced from but facing the centre of the spinning disc. A motor is located behind the convex surface of the disc in order to spin the disc and spray the fluid.

According to one aspect of the present invention, a spray device includes a disc arranged to be spun and means for supplying material to be sprayed from one side of the disc, the material being arranged to be supplied from the other side of the disc through an opening in the disc onto the one side of the disc. The disc may be detachably mounted on the device. As the material to be sprayed by the disc is not supplied through a pipe extending over the side of the disc, the material may be spun from the disc around its complete peripheral extent without impinging on any pipe. Furthermore, when it is required to replace the disc with one of a different size or character, there is no need to interfere with the material supply as there is with the prior arrangement where the supply pipe has to be moved away from the disc.

The spray device may include a diffuser arranged to cause material to be sprayed to be discharged in an outwards direction relative to the rotational axis of the disc onto the surface of the disc from which the material is to be sprayed. Alternatively or additionally, the diffuser may be arranged to cause the material to be sprayed to be discharged onto the disc at a region located around but spaced from the rotational axis of the disc. This may ensure a more accurate or even distribution of the material to be sprayed than can be achieved with the prior device in which the material to be sprayed is discharged onto the disc in a direction substantially concident with the rotational axis of the disc, and renders the distribution over the disc less susceptible to gravitational forces which may tend to cause the majority of the spray in the prior device to be directed slightly downwards prior to impinging on the disc.

Alternatively, the spray device may include displacement means or throttle means arranged to cause fluid to be directed straight onto the one side of the disc as soon as it leaves the opening in the disc. The displacement means or throttle means may be arranged to rotate with the disc. The device may include valve means arranged to control the flow of material to the disc which valve means may include the displacement means or throttle means. The displacement means or throttle means may be arranged to co-operate with the opening through which the material passes, and the location or spacing of the displacement means or throttle means from the opening may be adjustable. The valve means may be accessible from the side of the device located on the one side of the disc.

The supply of material to the disc may be arranged to be through a supply member prevented from rotating with the disc.

The opening in the disc may be located centrally on the disc.

The disc may be arranged to be spun by drive means located away from the device.

According to a further aspect of the present invention, a spray device includes a disc arranged to be spun and means for supplying material to be sprayed from the disc, the device including valve means arranged to control the flow of material to the disc.

The valve means may include displacement means or throttle means arranged to cause fluid to be directed straight onto the one side of the disc as soon as it leaves the opening in the disc. The displacement means or throttle means may be arranged to rotate with the disc. The displacement means or throttle means may be arranged to co-operate with the opening through which the material passes, and the location or spacing of the displacement means or throttle means from the opening may be adjustable.

According to another aspect of the present invention, a spray device includes a disc arranged to be spun and means for supplying material to the surface of the disc, and means for causing the material being supplied to the disc to be discharged onto the surface of the disc in an outwards direction relative to the rotational axis of the disc or, alternatively or additionally, at a region located around but spaced from the rotational axis of the disc.

According to another aspect of the present invention, a spraying system includes a plurality of spray devices as herein described. Two or more of the spray devices may have a common material supply, and two or more of the devices may be arranged to be coupled together whereby the discs may be rotated by a common drive means.

The present invention includes any combination of the herein described features.

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The invention may be carried into practice in various ways, but one embodiment will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a sectional side view of a spraying device;

Figure 2 is a rear view of the device shown in Figure 1, and

Figure 3 is a plan view of Figure 2.

The spraying device comprises a disc 10 which is detachably secured to one end of a hollow spindle 12 which extends through and is rotatably mounted via two spaced deep groove ball bearing assemblies 14 in a housing 16. The other end of the spindle 12 includes a pulley 18 having two adjacent V-groove sections 20 and 22 arranged to receive different V-groove belts. A grease nipple 62 is provided for lubrication of both bearing assemblies 14.

A feeder tube 24 extends throughout the spindle 12 and includes, at its end remote from the disc, an attachment point 26 for a source of fluid or mixture to be sprayed and, at its opposite end, it extends through a self lubricating bronze bearing 28 and its end opens onto a conical valve member 30 which is threadably mounted on a holder 32. The feeder tube cooperates with the spindle 12 via a pair of deep groove ball bearing assemblies 36.

Lip seals are provided for both sets of the deep groove ball bearing assemblies.

In use, the spindle 12 and disc 10 are rotated by a drive belt cooperating with the V-groove section 20 of the pulley 18. Fluid is passed through the feeder tube 24 to impinge on the stationary conical valve member 30.

When the fluid flow rate is considerable, the valve member 30 deflects the flow outwardly through passages (not shown) in the holder or end of the feeder tube and the fluid then hits a rotating diffuser plate 34 and is then deflected back and outwardly towards the surface 38 of the disc. When the fluid hits the disc it is caused to move outwardly as a result of the centrifugal force exerted by the spinning disc. The fluid then travels over the surface 38 until it leaves the periphery 40 of the disc and is discharged tangentially.

When the fluid flow rate is relatively low, the fluid hits the stationary valve member 30 and is caused to travel outwardly directly onto the surface 38 of the disc without passing to the diffuser plate 34. The valve member then may build up a slight back pressure in the feeder tube 24 to smooth out any pulses which may occur in the pressure of the fluid being supplied.

Excess fluid is caught in a drain channel 42 located beneath the disc and secured to the housing by an upwardly extending plate 44 which is connected to the housing

The spraying device is normally used to spray articles carried past a spraying area by a conveyer. Where the conveyer is a chain conveyor it may be required to spray articles on the conveyor from above and below in which case, for instance, four spraying devices may be located above, and four devices below the conveyor. The four devices above the conveyor may be located in a line across the direction of travel of the conveyor, with the discs being arranged to spray towards and across the centre of the conveyor (that is to say the two discs on one side of the centre line spray towards the discs on the other side). The devices beneath the conveyor may be arranged in a similar manner.

It will be appreciated that, in order to avoid waste of the material being sprayed and in order to ensure even spraying or coating of products it is desirable to be able to control the spray from each disc. Thus the individual valve members 30 associated with each disc 10 can be moved towards or away from the open end of the feeder tube 24 by causing rotation of the slotted end 46 to control the rate at which fluid is sprayed from the associated disc. Accordingly each spraying device can be connected to a common source of fluid. Furthermore, each disc has associated therewith a mask which partially surrounds the disc to allow sprayed fluid to be collected from the periphery of the disc which would not be sprayed onto the products.

As the spraying device includes a pulley for cooperation with a V-belt, the motor causing rotation of the disc can be positioned remote from the spraying device. Furthermore a single motor can cause the rotation of two or more devices by positioning a further V-belt around the V-groove section 22 and connecting that belt either directly or indirectly to the pulley of another spraying device. A further belt can then be secured to the other V-section of that pulley for driving another spraying device.

Different discs may be desired to be used on the spraying devices either because of their location, or in dependence upon the material being sprayed, the spraying effect to be achieved or the fluid being sprayed. Consequently the discs are detachably mounted on a flange 48 on the end of the spindle via bolts (not shown) which pass through spaced tabs 52 of the diffuser 34. The diffuser 34 may be pivotally or detachably mounted on the disc.

In order to prevent or inhibit the fluid from entering the bearing assemblies 14, the housing includes a lip 56 which extends away from the disc and surrounds a seal 58.

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A brace member 60, shown in Figures 2 and 3, is secured to the housing 16 and the attachment point 26 of the feeder tube 24 to prevent the tube from rotating with the hollow spindle 12.

Claims

1. A spray device including a disc arranged to be spun and means for supplying material to be sprayed from one side of the disc, the material being arranged to be supplied from the other side of the disc through an opening in the disc onto the one side of the disc.

2. A spray device as claimed in Claim 1 in which the disc is detachably mounted.

3. A spray device as claimed in Claim 1 or 2 including a diffuser arranged to cause material to be sprayed to be discharged in an outwards direction relative to the rotational axis of the disc onto the surface of a disc from which the material is to be sprayed.

4. A spray device as claimed in any preceding claim including a diffuser arranged to cause the material to be sprayed to be discharged onto the disc at a region located around, but spaced from the rotational axis of the disc.

5. A spray device as claimed in any preceding claim including displacement means, or throttle means arranged to cause fluid to be directed straight onto the one side of the disc as soon as it leaves the opening in the disc.

6. A spray device as claimed in Claim 5 in which the displacement or throttle means are arranged not to rotate with the disc.

7. A spray device as claimed in any preceding claim including valve means arranged to control the flow of material to the disc.

8. A spray device as claimed in Claim 7 when dependent on Claim 5 or Claim 6 in which the valve means includes the displacement or throttle means.

9. A spray device as claimed in Claim 5, 6 or 8, or Claim 7 when dependent on Claim 5 or 6 in which the displacement or throttle means are arranged to co-operate with the opening through which the material passes.

10. A spray device as claimed in Claim 9 in which the location or spacing of the displacement or throttle means from the opening is adjustable.

11. A spray device as claimed in Claim 7, or any of Claims 8 to 10 when dependent upon Claim 7 in which the valve means are accessible from the side of the device located on the one side of the disc.

12. A spray device as claimed in any preceding claim in which the supply of material to the disc is arranged to be through a supply member prevented from rotating with the disc.

13. A spray device as claimed in any preceding claim in which the disc is arranged to be spun by drive means located away from the device.

14. A spraying system including a plurality of devices as claimed in any preceding claim in which two or more of the devices are arranged to be coupled together whereby the discs of each device may be rotated by a common drive means.

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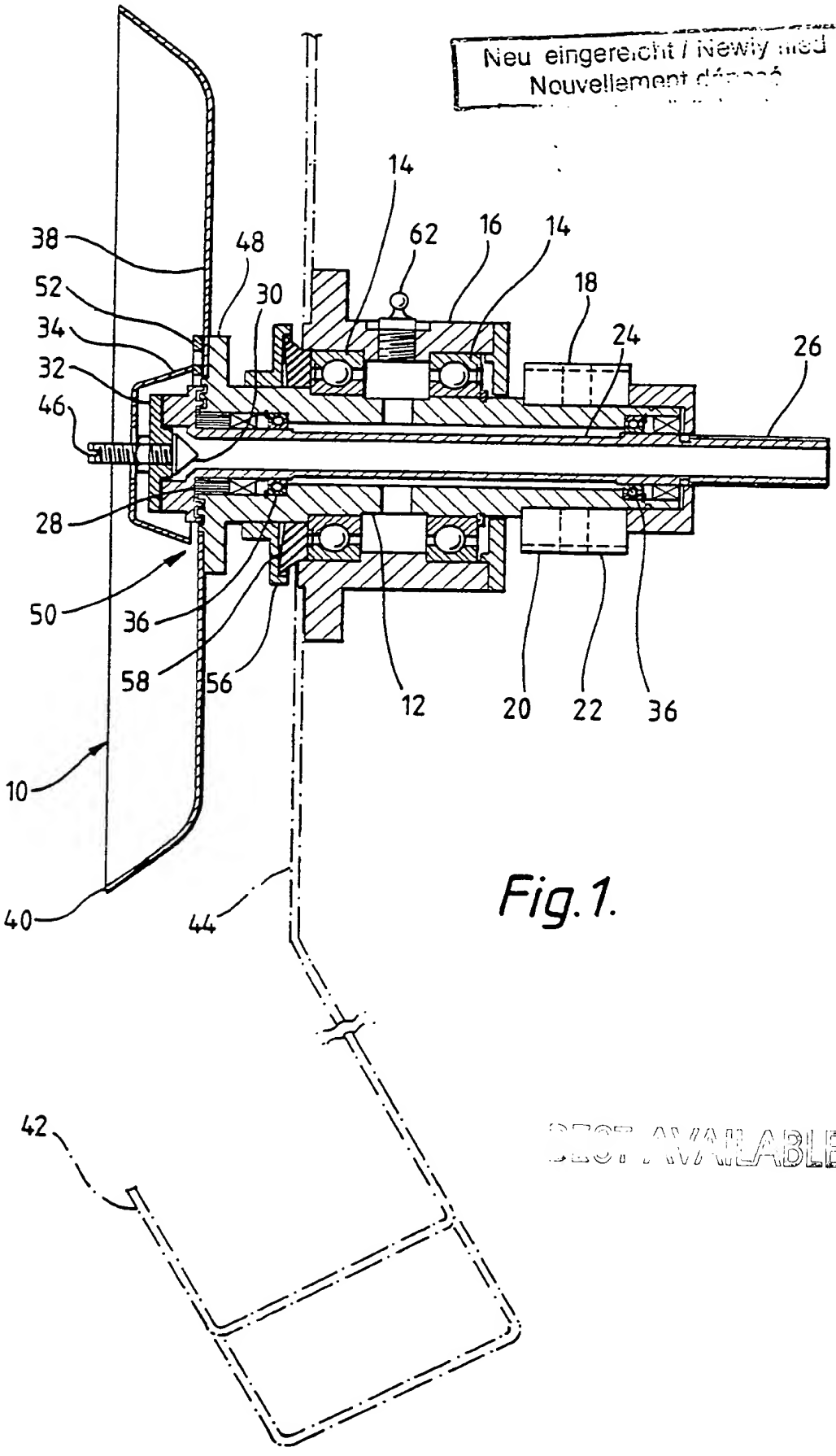

Fig.1.

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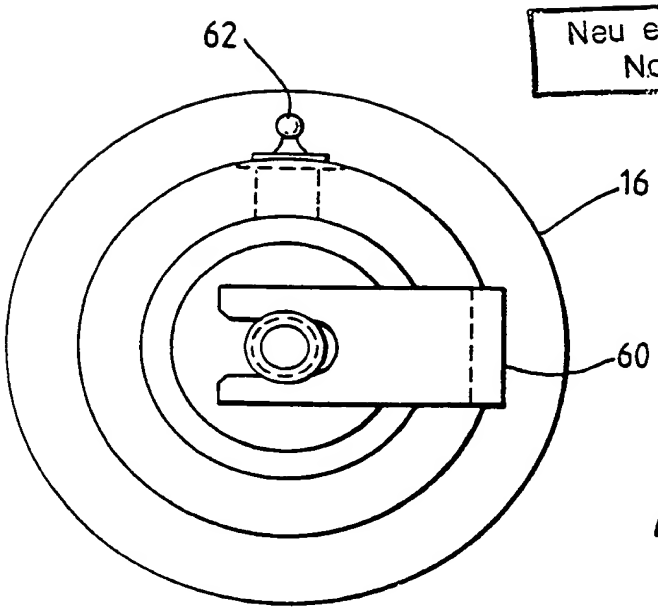

Fig.2.

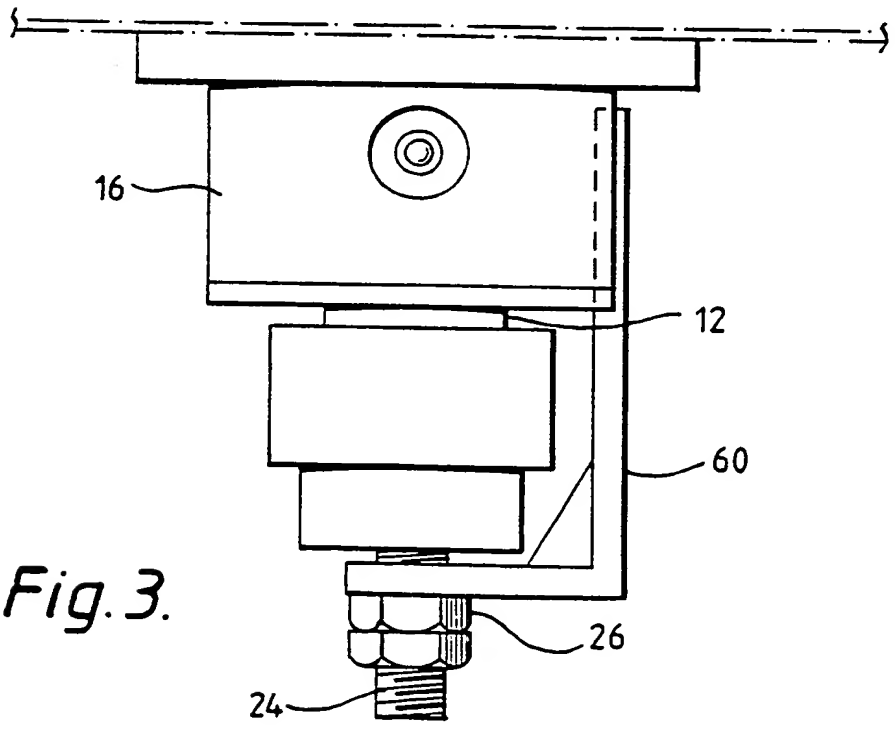

Fig.3.

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